ERIC Document Resume	See Instruction Sheet	DATE OF RESUME	DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER	2. ORIGINATOR CONTROL NO(S).	3. IDENTIFICATION NO.	DO NOT WRITE IN SPACE BELOW
ED001628	N.A.	N.A.	

4. AUTHOR(S):
Garber, Claire N.

5. TITLE OF DOCUMENT ABSTRACTED:
Great Cities School Improvement Program, School District of Philadelphia: Second Year, Arithmetic

6. PUBLICATION TITLE:
N.A.

7. EDITOR(S):
N.A.

8. PLACE OF ORIGIN
Great Cities School Improvement Program
ORG.
ST.
Philadelphia, Pa.
CITY, STATE

9. PUBLISHER OR SOURCE
Great Cities School Improvement Program
School District of Philadelphia

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	N.A	7

TELE. EXT.
INST/LOC CODE

MICROFILM COPY AVAILABLE
YES ☒ NO ☐

COPYRIGHT GRANTED
YES ☐ NO ☒

COPYRIGHT RELEASE FILED
YES ☐ NO ☐

TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

OTHER ERIC REFERENCES:

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR
teacher guide

16. INDEXING TERMS (6-12)

teaching approaches	numberlines	problem solving	second grade
number systems	elementary education	culturally disadvantaged	
arithmetic curriculum	process relationships	Great Cities School Improvement Program, Philadelphia, Pennsylvania	
	student motivation		

17. ABSTRACT (MAX. 250 WORDS)

It is suggested that the second year of arithmetic instruction should begin, if necessary, with a review of the work of the previous grade. The number system should be developed with backward and forward counting and the introduction of 10 and the zero.

The whole numbers unit should develop multiplication and division facts through groups up to 9; number lines could be used to explain the relationships between numbers. Children should be able to discuss the relationships between the processes of addition and multiplication, multiplication and division, addition and subtraction, subtraction and division.

Money can be used to show how numbers may be used concretely. Weights and measures can be further developed with emphasis given to the division of parts such as one quarter hour, inches, and pints. Fractions should be introduced with emphasis on thirds and fourths, and a review of one half. The thermometer can be used to demonstrate degrees. Problem solving can be introduced; yet, problem solving should take place whenever an appropriate situation naturally arises. The children should be encouraged to make up problems in their own words, to write them on the blackboard and to discover the answers.

Specific teaching approaches are suggested and illustrated.

ERIC No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION	20. DIVISION OR DEPT.	21. CONTRACT NO. / PROJECT NO.
	22. TOTAL COST OF PROJECT	
	23. DURATION OR PROJECT	U.S. Department of Health, Education, and Welfare Office of Education

ERIC Form 1

REPRINTED BY PERMISSION
U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN PRINTED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

ED001628

GREAT CITIES SCHOOL IMPROVEMENT PROGRAM

SCHOOL DISTRICT OF PHILADELPHIA

SECOND YEAR

Claire N. Garber
Arithmetic Consultant

BLANK PAGE

GREAT CITIES SCHOOL IMPROVEMENT PROGRAM
SCHOOL DISTRICT OF PHILADELPHIA

SECOND YEAR

REVIEW AND IF NECESSARY RETEACH THE WORK OF THE PREVIOUS GRADE

I. Number System

A. Counting

1. Counting by 1's, 2's, 5's and 10's to 100

2. Counting backward as well as forward.

Counting forward is the basis for addition and multiplication.
Counting backward is the basis for subtraction and division.

B. Concept of 10.

1. Introduce this important concept with many concrete situations.

a. Using a place value pocket, allow the children to make a bundle of ten ones and place it in the pocket for tens.

Individual place value pockets with toothpicks may be used at the children's desks.

b. Representative symbols may be used such as blue strips for ones, orange for tens.

c. Money may be used. Add one penny to nine (9) pennies. Change these for one dime.

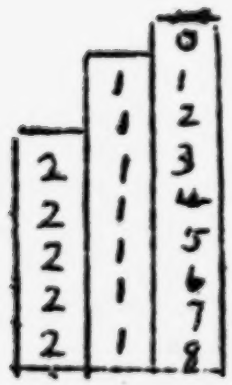
d. In each case the children can see there are no ones left in the column or place for ones, we now have one bundle in the ten column or one dime.

2. Introduce the Zero.

It holds a place.
It tells us we have none of these.

3. Develop the understanding of the value of ones and tens to a hundred.

4. Make a device to show developments of decades.



The ones remain constant.

The tens change as we go from one decade to another.

II. Whole Numbers

A. Develop the multiplication and division facts through groups up to 9.

1. Children should have the opportunity to discover the facts with the use of concrete materials to illustrate social situations within their experience.

2. In multiplication the children are led to understand the multiplier tells the number of groups or sets and the multiplicand tells the size of the group or set.

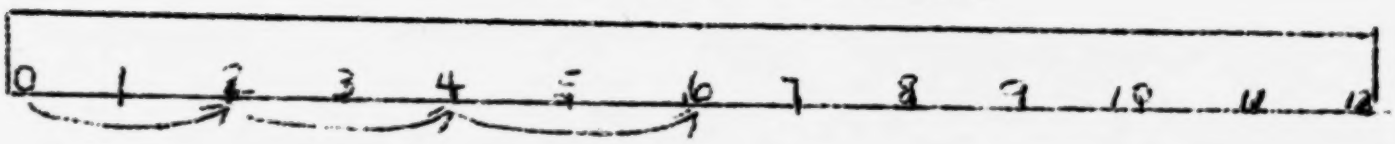
We say 3 twos = 2 SIZE of group or set
(of) x 3 NUMBER of groups or sets
6

We understand, we have 3 groups of twos.

We say 2 threes = 3
x 2
6

Thus we read multiplication up saying the multiplier first to establish the understanding 2 groups of 3 things in each set.

USE NUMBERLINE TO EXPLAIN



3 groups or sets of 2 = 6

3. Division should be introduced in a problem situation which the children can understand and are able to illustrate concretely.

a. Jerry has 6 puzzles. He wants to put them on the shelf in piles of twos. How many piles will he have?

As the children enact this problem the word "groups" or "sets" may be substituted for piles. When they are ready they record the problem numerically as

2 (size of each group or set) | 3 (number of groups) to (all the puzzles

We have found how many equal groups, in this case 2's are contained in 6. This is the containing idea of division, or measurement idea.

We read this: how many 2's are there in 6?

b. We may also have the problem: Jerry has 6 puzzles. He wants to share these equally with his friend, Dick. How many puzzles will each one get?

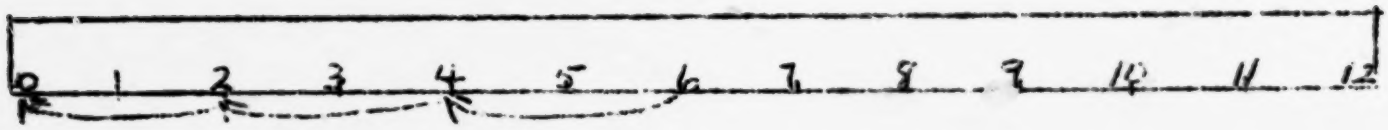
We have 2 children or the number of groups we have is 2. We want to know how many, or the size of the group, each child will get. Illustrate: give each child one puzzle at a time until we have no puzzles left. We have found how many each child will get.

$$\text{2 children (or sets)} \;\overline{)\;\text{6 puzzles}}\qquad \frac{\text{3 puzzles for}}{}\ \text{each child}$$

This is the idea of sharing or partitioning.

c. Use horizontal form, too. $6 \div 2 = 3$. We say 6 divided by 2 is 3. This is the <u>equational form</u> and must have = sign.

d. Use a number line



e. Help the children see that there is a fractional idea in division. When we divide by 2's the answer is $\frac{1}{2}$ of the total number, by 3's the answer is $\frac{1}{3}$, etc.

f. Develop uneven division; ~~that is, division which has a~~ remainder.

4. Multiplication and division are inverse operations, one can undo the other.

5. Children should understand the related facts of multiplication and division; as:

4	3	12

$$\begin{array}{r} 4 \\ \times 3 \\ \hline 12 \end{array} \qquad \begin{array}{r} 3 \\ \times 4 \\ \hline 12 \end{array} \qquad 4\overline{)\,12}^{\,3} \qquad 3\overline{)\,12}^{\,4}$$

6. Organize in table form after understanding has been developed.

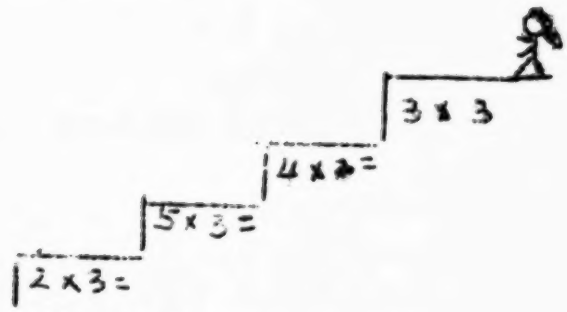
Multiplication may use "of" when reading x sign; as:

1 group of 5 = 5 then, one 5 = 5
2 groups of 5 = 10, etc. two 5's = 10

7. After the understanding is well established we try to develop automatic response, or mastery by drilling. Vary the drill with many drill devices as well as using flash cards.

8. Some drill devices.

Give answers only.



Walk up the steps.

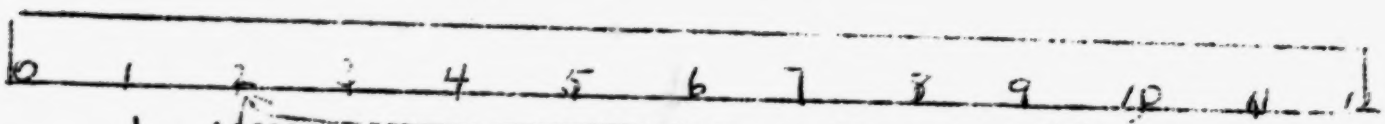
B. Addition and subtraction combinations are studied through eighteen.

1. We take a group or set apart. We are left with a smaller set or group. This is subtraction. We use the minus sign (-). We make the transition from "take away" to "from". Hence, we say 8 from 10 is 2.

$$\begin{array}{r} 10 \\ -\ 8 \\ \hline 2 \end{array}$$

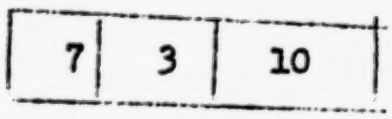
2. We show this concretely and use social situations for better understanding.

3. We use the number line.



4. Addition and subtraction are studied as related facts. Addition and subtraction are inverse operations, one undoes the other.

5. Use related facts cards.



Ask the children to give you the related facts.

$$\begin{array}{r} 7 \\ 3 \\ \hline 10 \end{array} \qquad \begin{array}{r} 3 \\ 7 \\ \hline 10 \end{array} \qquad \begin{array}{r} 10 \\ -7 \\ \hline 3 \end{array} \qquad \begin{array}{r} 10 \\ -3 \\ \hline 7 \end{array}$$

6. Teach everything you can about a number before you go on to another. Thus, teach all the addition, subtraction, multiplication and division combinations of a number.

7. Teach addition and subtraction of two-place numbers without regrouping.

   a. Use place value pockets.

   b. Express the examples many ways. Here are a few.

32 14 46	3 tens 2 ones 1 ten 4 ones 4 tens 6 ones	30 + 2 = 32 10 + 4 = 14 40 + 6 = 46
38 -24 14	3 tens 8 ones 2 tens 4 ones 1 ten 4 ones	30 + 8 = 38 -20 + 4 = 24 10 + 4 = 14

8. Extend addition and subtraction to higher decades without regrouping.

$$\begin{array}{cccc} 6 & 16 & 26 & 36 \\ -4 & -4 & -4 & -4 \\ \hline 2 & 12 & 22 & 32 \end{array} \text{ etc.}$$

$$\begin{array}{cccc} 4 & 14 & 24 & 34 \\ 3 & 3 & 3 & 3 \\ \hline 7 & 17 & 27 & 37 \end{array} \text{ etc.}$$

9. We add two-place numbers when zero is in the ones' place.

$$\begin{array}{ccc} 10 & 20 & 30 \\ 6 & 6 & 6 \\ \hline 16 & 26 & 36 \end{array} \text{ etc.} \qquad \begin{array}{cc} 40 & 19 \\ 15 & 30 \\ \hline 55 & 49 \end{array}$$

10. We subtract zero from tens and ones.

$$\begin{array}{r} 55 \\ -30 \\ \hline 25 \end{array}$$

C. Help children to see the relationship between the processes; as:

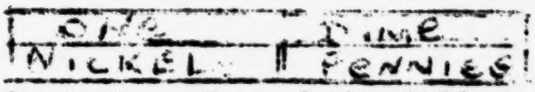
1. Between + and x
2. Between x and ÷
3. Between + and -
4. Between - and ÷

D. Help children to estimate answers and to check answers.

III. Money - - concretely

A. Introduce the $ sign and the decimal point .

B . Make change. Make a chart.



C. Show and talk about the value of the different pieces of money.

D. Use in problem solving.

E. Tell story of money and primitive man.

IV. Weights and Measures

A. Time - - - - One quarter hour - - - months - - - days - - - weeks - - - year - - .

B. Linear - - - Inches - - - foot,feet - - - yard.

C. Quantity - - Pint - - - - quart - - - gallon - - - pound (lb.).

D. Pairs.

E. Dozen.

F. Make many charts.

V. Fractions

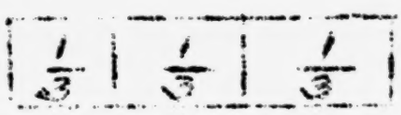
A. Introduce thirds and fourths.

Bottom number tells how many parts or pieces in the whole
Top number tells how many of the parts or pieces.

Example:

1 of the 3 pieces $\frac{1}{3}$

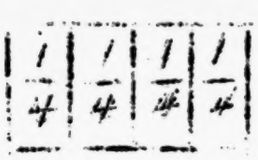
2 of the 3 pieces $\frac{2}{3}$

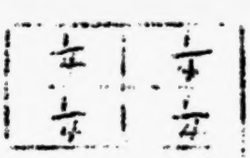


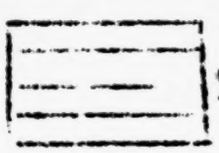
3 of the 3 pieces (the same as the whole)

B. Review one half.

C. Children use many shapes.







VI. Thermometer - - - Use ° to show degrees.

Keep a weather chart. Compare the temperature of September with that of December, etc.

VII. Problem Solving - - (Analytical and Critical Thinking)

Make the abstractions meaningful to the child. There should be NO SPECIAL TIME for working problems. Problem solving should take place when the situation arises, and at every level of the learning.

A. Have the children make up problems and use the children's problems on the blackboard.

B. Have the children understand the problem situation.

C. Read the problem - - Allow the children to put it into their own words.

D. Allow the children to suggest the question.

E. Help the children to discover if the answer is going to be a larger or smaller number than the numbers given.

F. Help the children to determine the process.

G. Have the children estimate the answer.

H. Have the children check their answers by discussion.

VIII. Extend the learnings

A. Work with unknown quantities after the facts have been taught.

Examples:

$3 + \square = 12$

$\square = 13 - 3$

$n \times 6 = 12$

$15 \div 3 = n$

B. Use number puzzles and magic squares.

Margaret Robinson
Dunbar School

/m

BLANK PAGE